



EOS MLS Upper Tropospheric and Lower Stratospheric Ozone Validation by Sonde Measurements & Other Ground-Based Datasets

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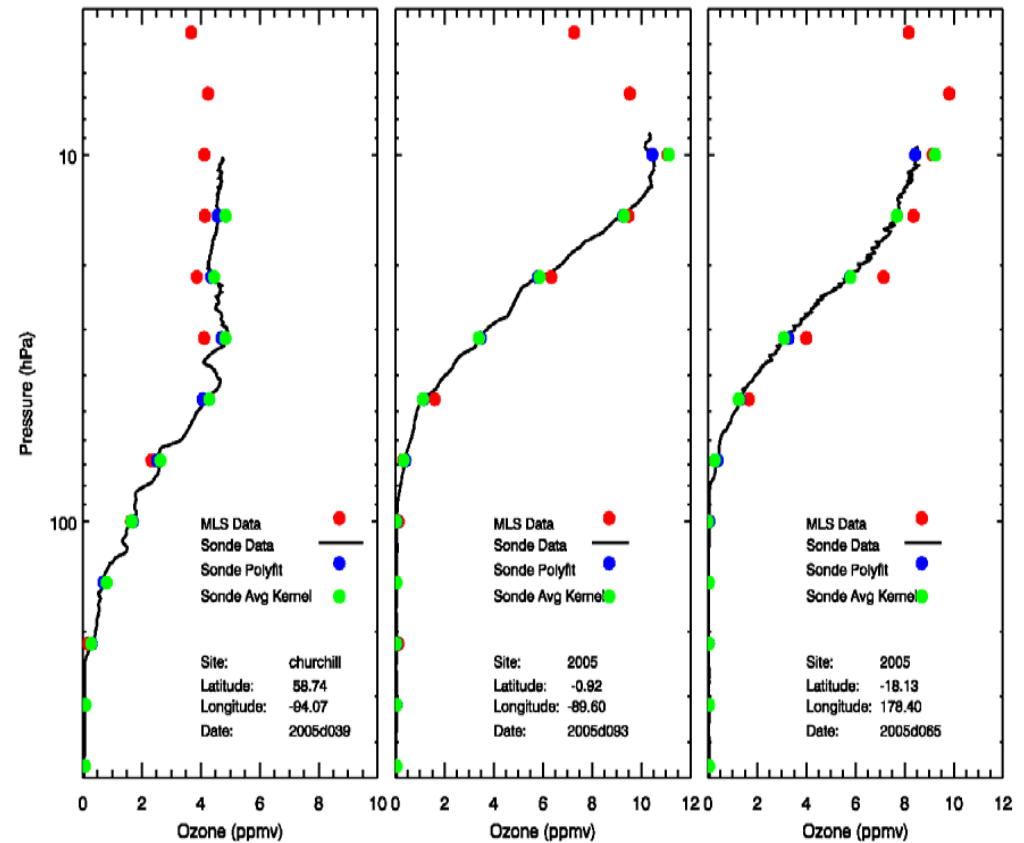
+ other contributors (lidar data, JPL team)

- Available data from AVDC

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- World map showing the locations of 20 SAGE II SAGE data sites. The sites are marked with red dots and labeled with their names. The map includes a latitude and longitude grid. The sites are distributed across North America, South America, Europe, Africa, and Asia.
- | Site Name | Approximate Latitude | Approximate Longitude |
|---------------------------|----------------------|-----------------------|
| Alert | 81 | -62 |
| Resolute | 79 | -60 |
| Churchill | 58 | -103 |
| Maniwagan | 55 | -100 |
| Kanadas Lake | 52 | -95 |
| Goose Bay | 53 | -58 |
| Point Barrow | 71 | -157 |
| United States Coast Guard | 65 | -150 |
| Barrow | 71 | -157 |
| Chukchi | 65 | -150 |
| San Cristobal | 1 | -75 |
| Paramaribo | 5 | -55 |
| Edmond | 10 | -10 |
| Ascension Island | 8 | -15 |
| Irene | 15 | 15 |
| La Réunion | 21 | 55 |
| Madrid | 40 | -4 |
| Syng | 35 | 105 |
| Wankarem | 35 | 115 |
| Syng | 35 | 105 |
| Syng | 35 | 105 |

Sample Profile Comparisons

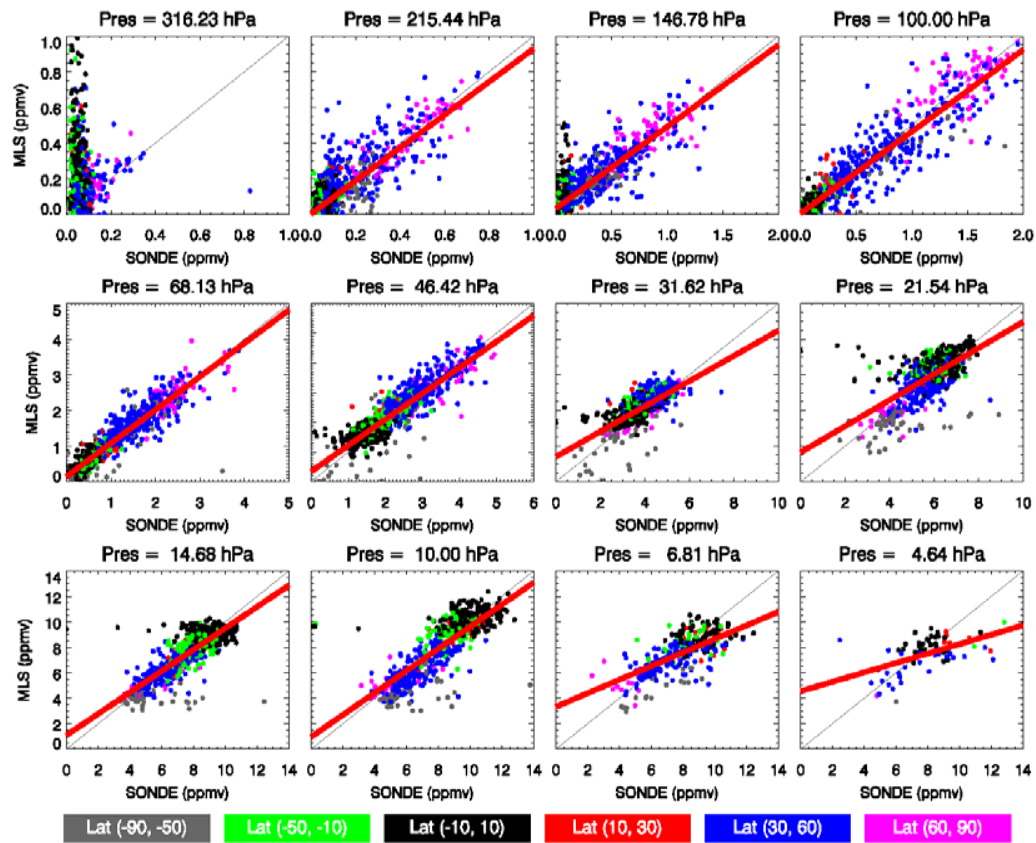
- Coincidence Profiles
 - Same day
 - Location within 1° latitude 12° longitude
- Least-squares fit is used here to fit the sonde profiles to the MLS vertical retrieval grid



Scatter Plots (color coded by latitude)

MLS V1.5 & Sondes

- Good correlation except at 316 hPa in equatorial and subtropics region (black, green, red)
- Upper stratospheric sonde data quality probably influences poorer comparisons there

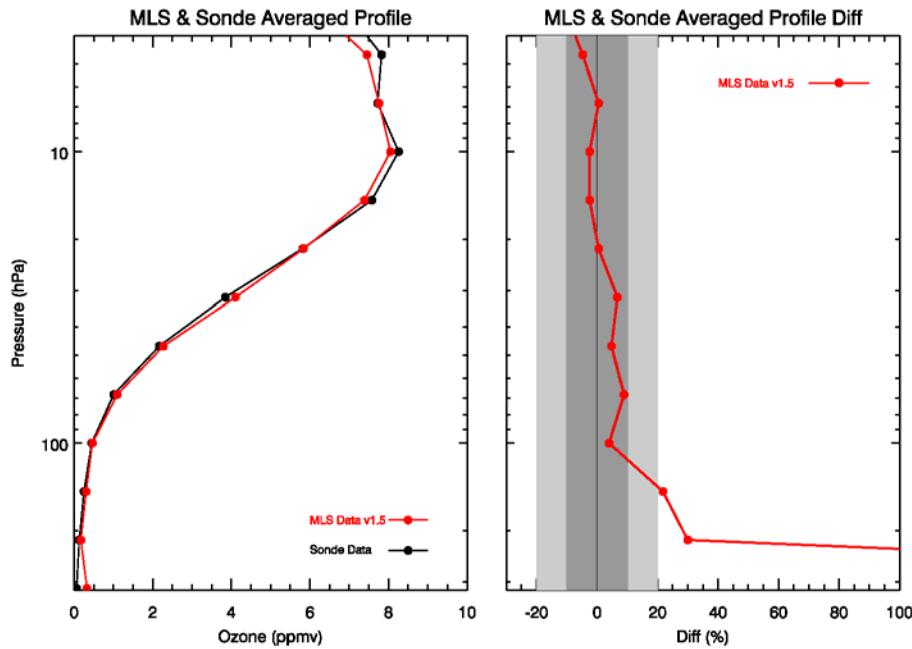


Comparisons with O3 Sonde Data

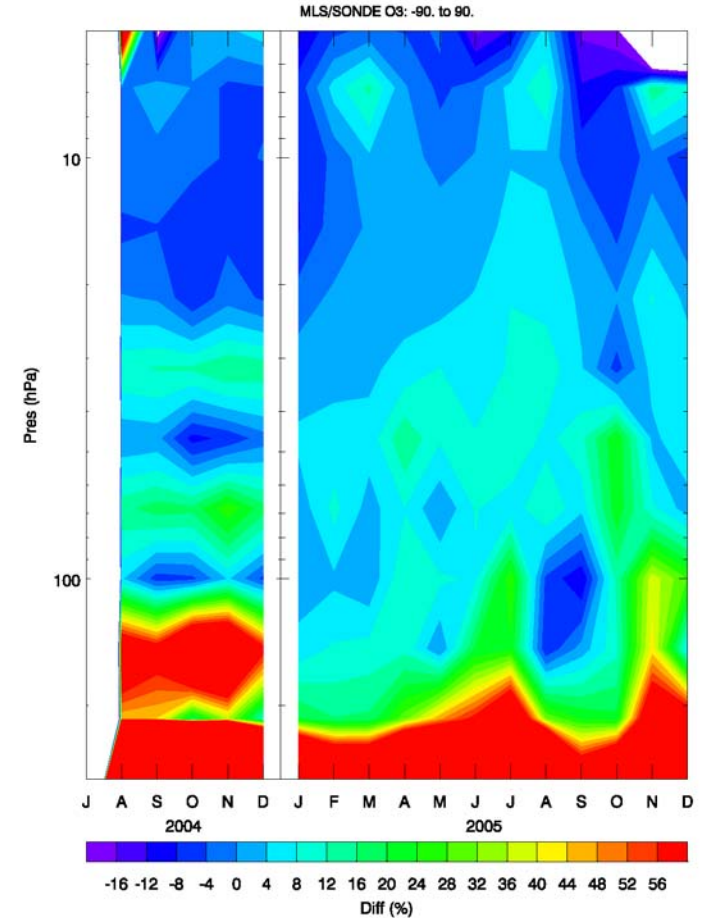


Globally-averaged comparisons

MLS V1.5 & Sondes



- The average differences are fairly constant in time



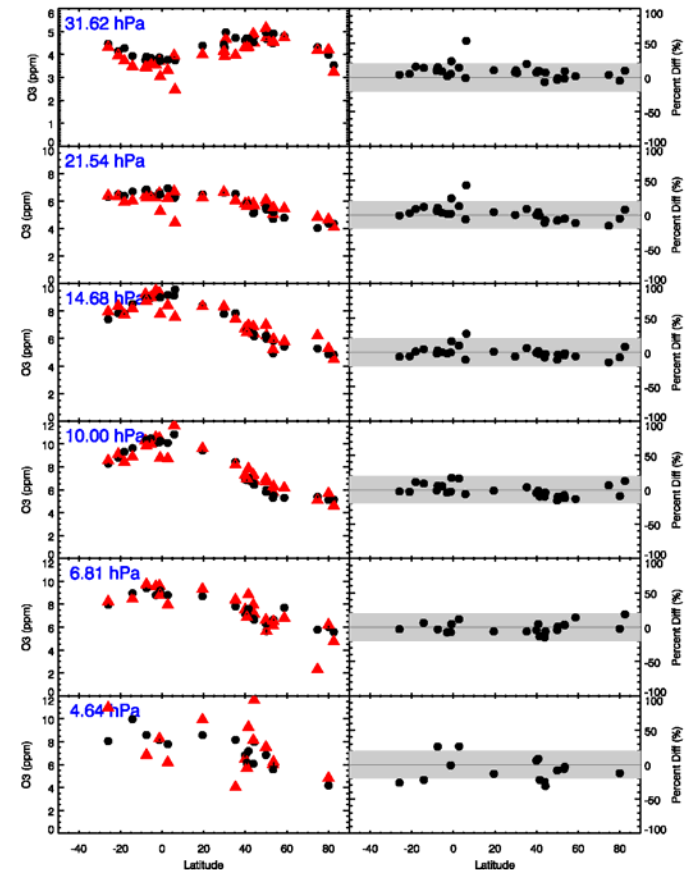
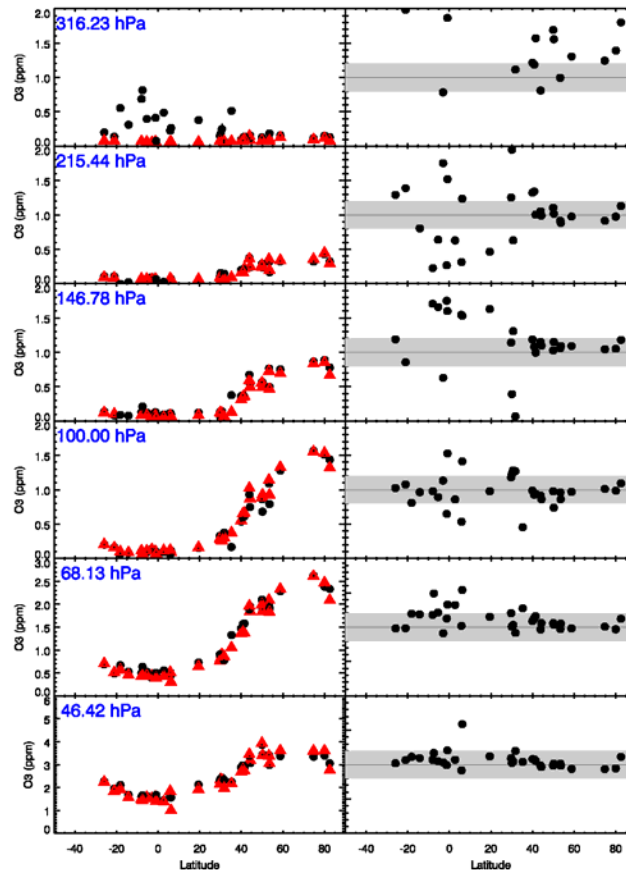
Comparisons with O3 Sonde Data



Latitude Distribution (at different pressure levels)

MLS V1.5 & Sondes

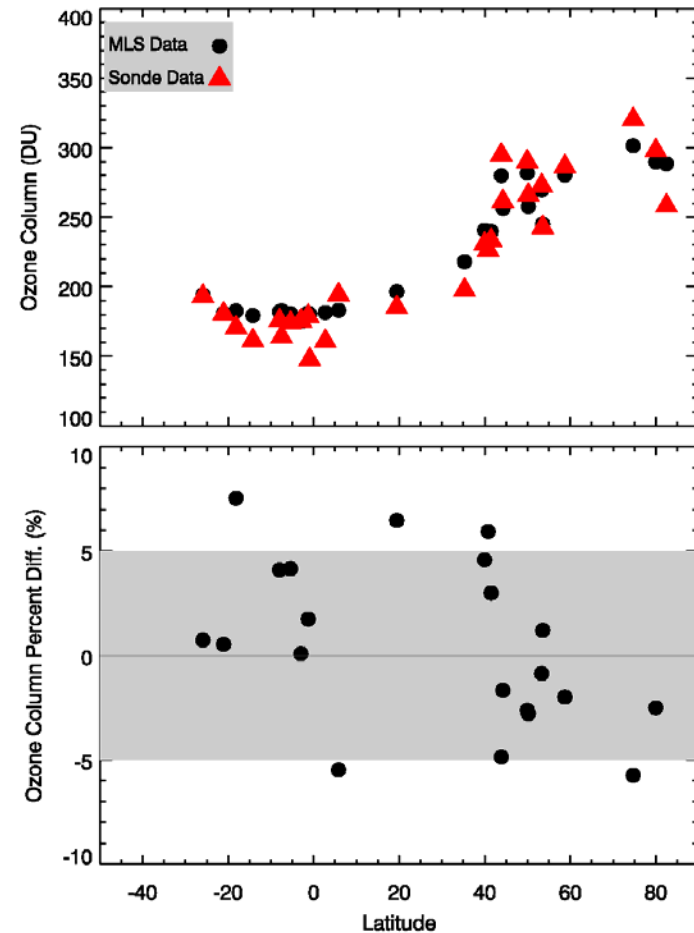
- There is generally good tracking versus latitude down to 215 hPa
- The differences are most often within 20% or better down to 215 hPa, except in the tropics



Latitude Distribution (Column Ozone for LS)

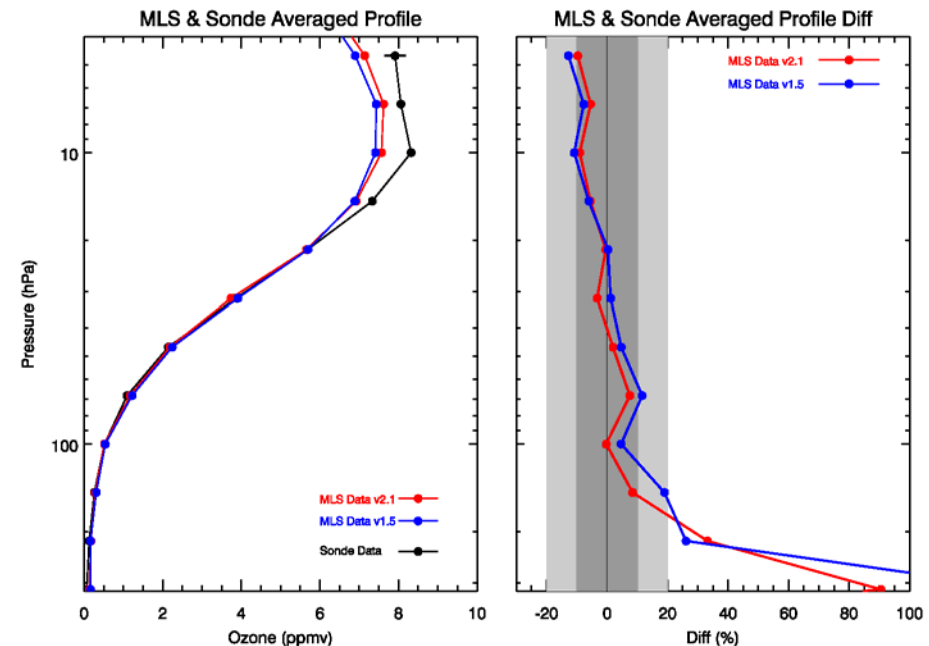
MLS V1.5 & Sondes

- Many differences are within 3%; need to look at the larger differences more carefully



MLS Ozone v2.1, v1.5 & Sondes

- Based on 17 days of MLS v2.1 data
58 coincidence profiles (available on AVDC)
- MLS v2.1 O₃ shows better agreement with sonde data than v1.5
 - within 5% from ~ 20 to 100 hPa
 - 10% in US, MLS biased lower
 - still biased high in UT, but improved over v1.5
- Upper stratospheric sonde data quality probably influences poorer comparisons there
- As for comparisons vs satellite data, we see the change in slope for MLS v2.1



Times Series of MLS Ozone v1.5 & LIDAR

- 2 Long-term LIDAR Measurement Sites

- **Table Mountain(34.5N, 117.7W)**

- **Mauna Loa(19.5N, 155.7W)**

- Seasonal Cycles can be seen in both datasets at 15 hPa

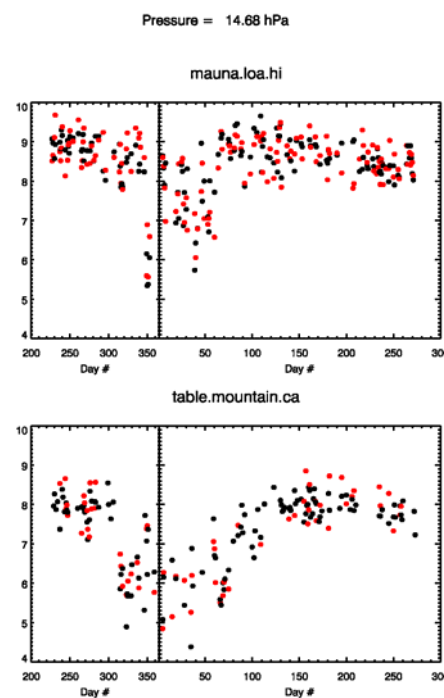
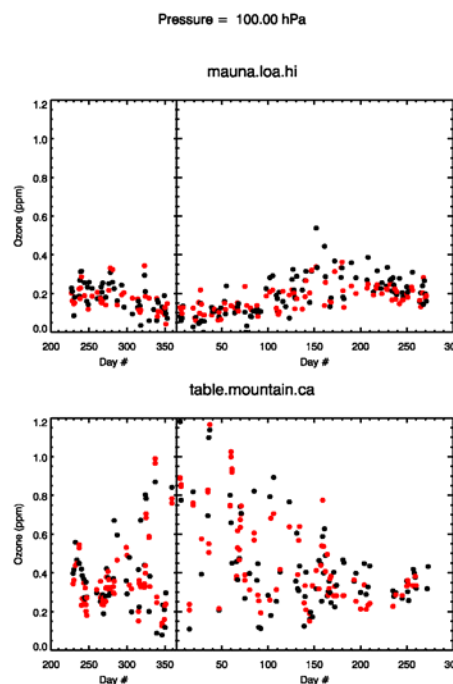
- MLS and LIDAR are tracking each other very well at 100 hPa in Table Mountain even data has large variability

Mauna Loa

Table Mountain

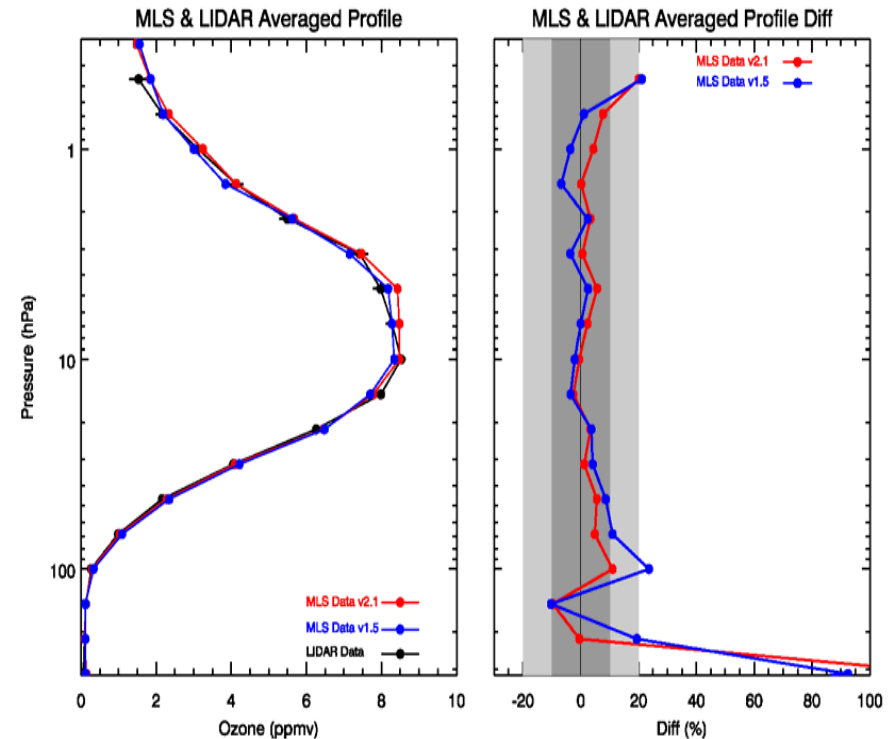
Pres=100 hPa

Pres=15 hPa



MLS Ozone v2.1, v1.5 & LIDAR

- Based on 17 days of MLS v2.1 data
18 coincidence profiles (available on AVDC)
- MLS v2.1 O3 shows better agreement with LIDAR data than v1.5
- v2.1 – lidar within 5-10% for P between 215 and 0.7 hPa
- MLS – sondes differences near 10 hPa is not observed in LIDAR comparison
- MLS is biased high at 315 hPa





Summary

MLS V2.1 Data

- V2.1 shows better overall agreement than V1.5 compared to sondes & LIDAR
- The differences between MLS and sondes are within 10%, except at pressure 215 & 316 hPa based on 17 days available MLS v2.1 data
- MLS v2.1 and LIDAR within 5-10% for P between 215 and 0.7 hPa
- There is still a high bias in UT especially in tropics



Summary (cont.)

Validation plans and paper

- Would be good to add more sondes data from European sites
- Some issues with lidar data files (now on AVDC)

Comparisons with others datasets

- Ground-Based Microwave Data (some work presented by others at Sep. 2005 meeting)

Please discuss any related plans for validation papers (for JGR special issue) with MLS team